

FIG. 1

DIGITAL NUMBER 8

(SIGNAL LEVEL)

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

SAMPLE NUMBER (INDEX)

OBTAIN OR CREATE ORIGINAL DIGITAL SIGNAL OR IMAGE

ESTIMATE ROUGH OFFSET AND RMS NOISE

CHOOSE N OR N-BIT IDENTIFICATION WORD, E.G. 32

GENERATE N-BIT IDENTIFICATION WORD

GENERATE OR SYNTHESIZE N "RANDOM" INDEPENDENT SIGNALS WITH ROUGHLY GAUSSIAN DISTRIBUTION ABOUT SOME MEAN VALUE, WHERE SIGNALS HAVE EQUAL EXTENT AND DIGITAL SPACING OF ORIGINAL DIGITAL SIGNAL OR IMAGE

APPLY DIGITAL FILTER WHICH ATTENUATES BOTH LOW AND HIGH FREQUENCIES, LEAVING MIDDLE-RANGE FREQUENCIES LARGELY INTACT

CONDENSE N RANDOM SIGNALS TO A LOWEST ACCEPTABLE BIT VALUE IF MEMORY OR STORAGE SPACE IS AT A PREMIUM

ADD ALL RANDOM IMAGES TOGETHER WHICH HAVE A CORRESPONDING '1' IN THEIR ASSOCIATED BIT-PLACE-VALUE OF THE N-BIT IDENTIFICATION WORD, CALL THIS THE BASE COMPOSITE SIGNAL OR IMAGE

EXPERIMENT VISUALLY WITH GAIN AND GAMMA APPLIED TO BASE COMPOSITE SIGNAL OR IMAGE, ADDING THIS TO ORIGINAL DIGITAL SIGNAL OR IMAGE, AND DETERMINING THE ACCEPTABLE PERCEIVED NOISE LEVEL

APPLY FOUND GAIN AND GAMMA TO BASE COMPOSITE, ADD TO ORIGINAL, THEN CALL THIS THE DISTRIBUTABLE SIGNAL OR IMAGE

STORE AWAY AND SECURE ORIGINAL SIGNAL OR IMAGE, ALONG WITH N-BIT IDENTIFICATION WORD AND THEN RANDOM SIGNALS

SELL OR DISTRIBUTE THE DISTRIBUTABLE SIGNAL OR IMAGE

OBTAIN DIGITAL OR NON-DIGITAL COPY OF SUSPECT SIGNAL OR IMAGE

DIGITIZE IF NOT ALREADY DIGITAL

CUT AND MASK PORTION OF SIGNAL OR IMAGE BELIEVED TO BE SUSPECT (ONLY IF ENTIRE SIGNAL OR IMAGE IS NOT SUSPECT)

PROCURE ORIGINAL DIGITAL SIGNAL OR IMAGE AND CUT AND MASK TO ROUGHLY THE SAME LOCATION OR SEQUENCE

VISUALLY RESCALE AND REGISTER THE CUT-OUT SUSPECT SIGNAL TO THE CUT-OUT ORIGINAL SIGNAL

RUN THROUGH SEARCH PROGRAM WITH MEAN SQUARED ERROR AS CRITERIA AND X OFFSET, Y OFFSET, AND SCALE AS THE THREE VARIABLES

APPLY X OFFSET, Y OFFSET, AND SCALE TO CUT-OUT SUSPECT, THEN RESAMPLE ONTO EXACT GRID AND CUT-OUT OF ORIGINAL SIGNAL

RUN THROUGH SEARCH PROGRAM WITH MEAN SQUARED ERROR AS CRITERIA AND DC OFFSET, GAIN, AND GAMMA AS THE THREE VARIABLES; APPLY TO SUSPECT

SUBTRACT ORIGINAL FROM SUSPECT, GIVING DIFFERENCE SIGNAL OR IMAGE

STEP THROUGH ALL N RANDOM INDEPENDENT SIGNALS, MASKED AS ORIGINAL AND CROSS-CORRELATED WITH DIFFERENCE SIGNAL IN IMMEDIATE NEIGHBORHOOD OF REGISTRATION POINTS

FIND 0 AND 1 LEVEL BY AVERAGING FIRST FOUR 0101 CODE VALUES

ASSIGN EITHER A 0 OR A 1 TO EACH CROSS-CORRELATION RESULT DEPENDING ON PROXIMITY TO THE AVERAGES OF PREVIOUS STEP

CHECK RESULT AGAINST SECURED IDENTIFICATION NUMBER

PROSECUTE IF IT MATCHES? OR AT LEAST SEND A NASTY LETTER DEMANDING RECOMPENSE

FIG. 5

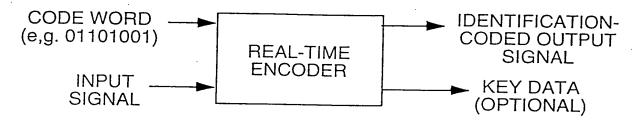
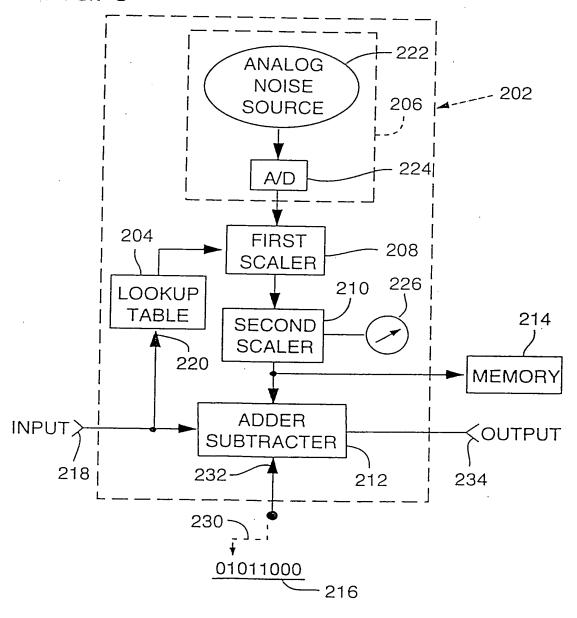


FIG. 6



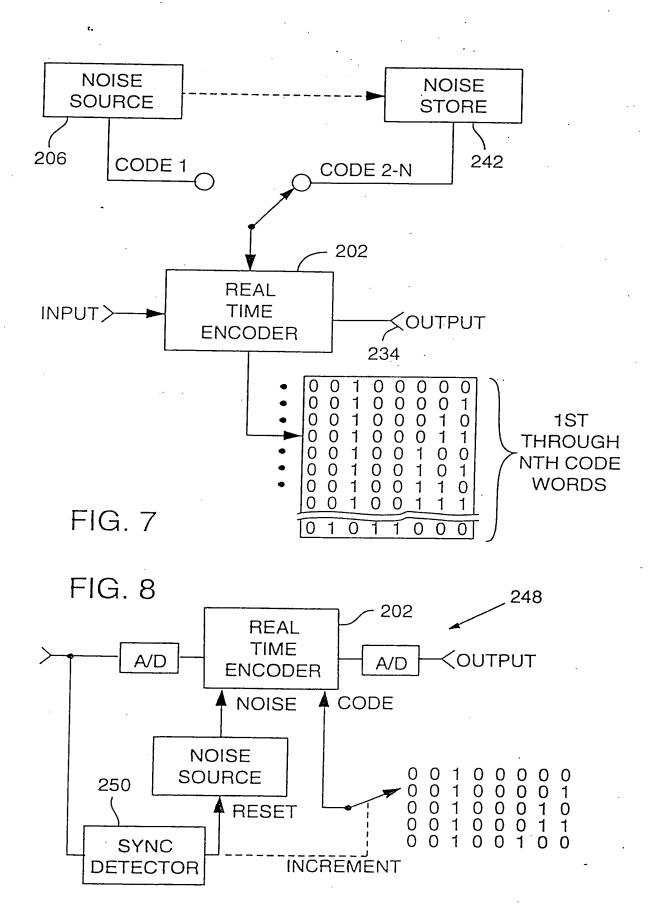
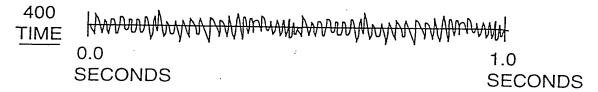
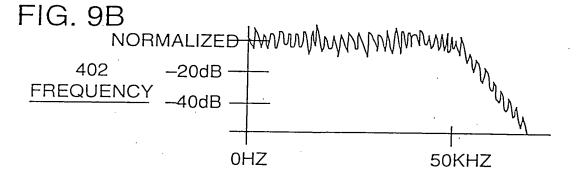
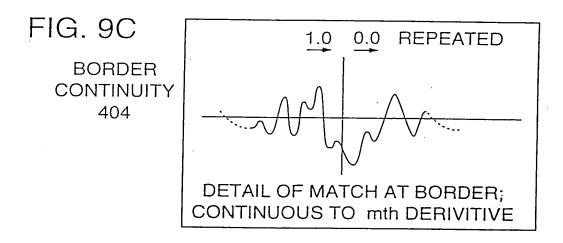
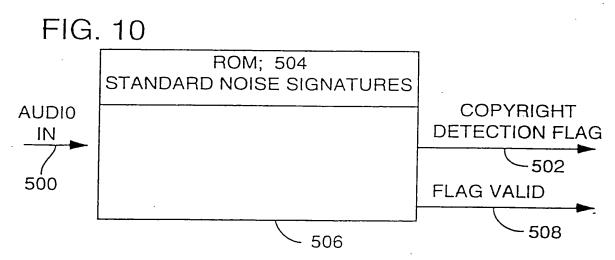


FIG. 9A









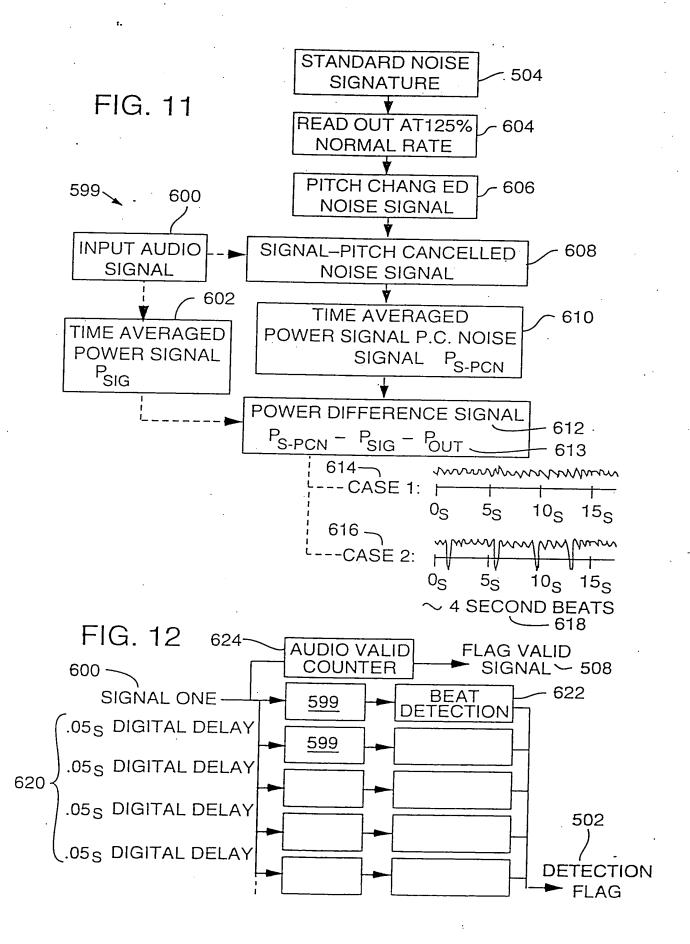
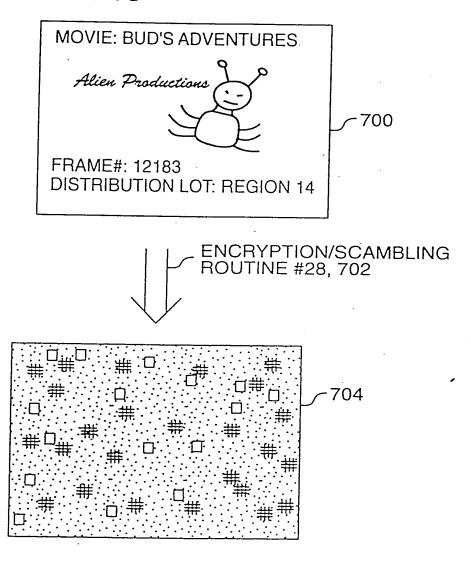
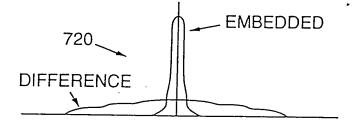


FIG. 13

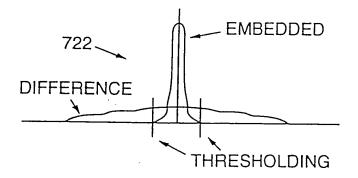


PSEUDO-RANDOM MASTER SNOWY IMAGE (SCALED DOWN AND ADDED TO FRAME 12183)

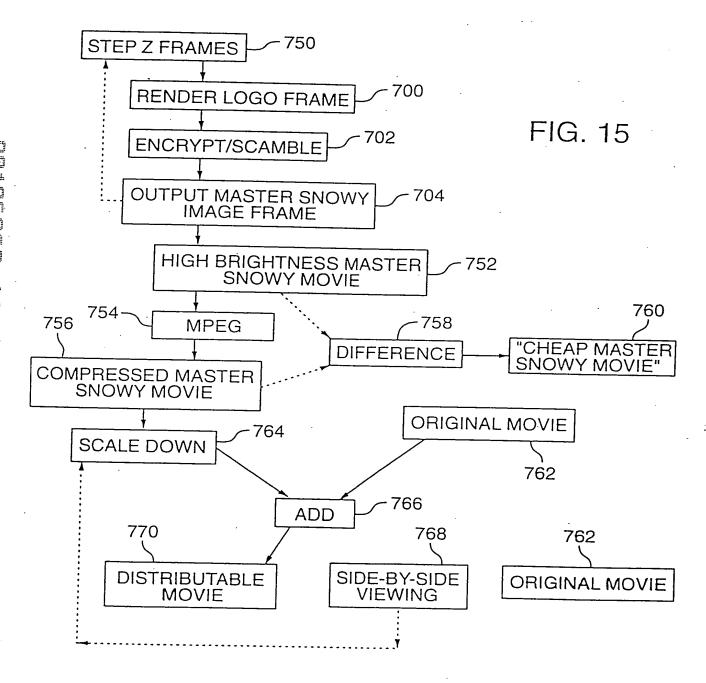
FIG. 14



MEAN-REMOVED HISTOGRAMS OF DIFFERENCE SIGNAL AND KNOWN EMBEDDED CODE SIGNAL



MEAN-REMOVED HISTOGRAMS OF FIRST DERIVATIVES (OR SCALER GRADIENTS IN CASE OF AN IMAGE)



001101011101001010... ...JOE'S IMAGE...

802

HEADER

DATA STREAM

JOE'S IMAGE	·	JOE'S IMAGE	JOE'S IMAGE	ឃ	JOE'S IMAGE
JOE'S IMAGE	JOE'S IMAGE	JOE'S IMAGE	JOE'S IMAGE	JOE'S IMAGE	JOE'S IMAGE
JOE'S IMAGE	JOE'S IMAGE	JOE'S IMAGE	JOE'S IMAGE	JOE'S IMAGE	JOE
JOE'S IMAGE	JOE'S IMAGE	JC JOE'S IMAGE	JOE'S IMAGE	JOE'S IMAGE	JOE'S IMAGE
JOE'S IMAGE			<u> </u>		

FIG. 17

64 BIT LENGTH 32 BIT DATA WORD SIZE DATA...

822 824 826

UNIVERSAL EMPIRICAL DATA FORMAT

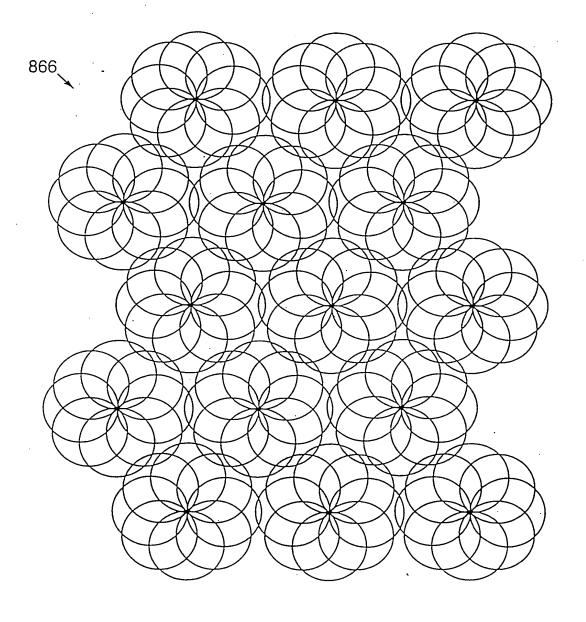
FIG. 18

850

852

864

FIG. 19



QUEST FOR MOSAICED KNOT PATTERNS WHICH "COVER" AND ARE COEXTENSIVE WITH ORIGINAL IMAGE; ALL ELEMENTAL KNOT PATTERNS CAN CONVEY THE SAME INFORMATION, SUCH AS A SIGNATURE, OR EACH CAN CONVEY A NEW MESSAGE IN A STEGANOGRAPHIC SENSE

FIG. 21A

900 C 2C C
2C 4C 2C
C 2C C

WHERE C = 1/16

ELEMENTARY BUMP (DEFINED GROUPING OF PIXELS WITH WEIGHT VALUES)

FIG. 21B

	:	;	:	:	:	:	:	:	:	:	:	:	:	:
··· <u> </u>	-	-		├		-	 _	<u> </u>	<u> </u>	<u> </u>	<u> </u>		-	<u> </u>
	2	<u> </u>	3	<u> </u>	4		5		6	·	7		0	L.
•••-										<u>}</u>				
	6		7		0		1		2		3		4	
						С	2C	С						
	2		3		4	2C	4C	2C	6		7		0	
						С	2C	С						
	6		7		O		1		2		3		4	
				Ţ										

EXAMPLE OF HOW MANY ELEMENTARY BUMPS, 900, WOULD BE ASSIGNED LOCATIONS IN AN IMAGE, AND THOSE LOCATIONS WOULD BE ASSOCIATED WITH A CORRESPONDING BIT PLANE IN THE N-BIT WORD, HERE TAKEN AS N=8 WITH INDEXES OF 0-7. ONE LOCATION, ASSOCIATED WITH BIT PLANE "5", HAS THE OVERLAY OF THE BUMP PROFILE DEPICTED.

874

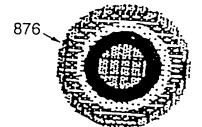
FIG. 20

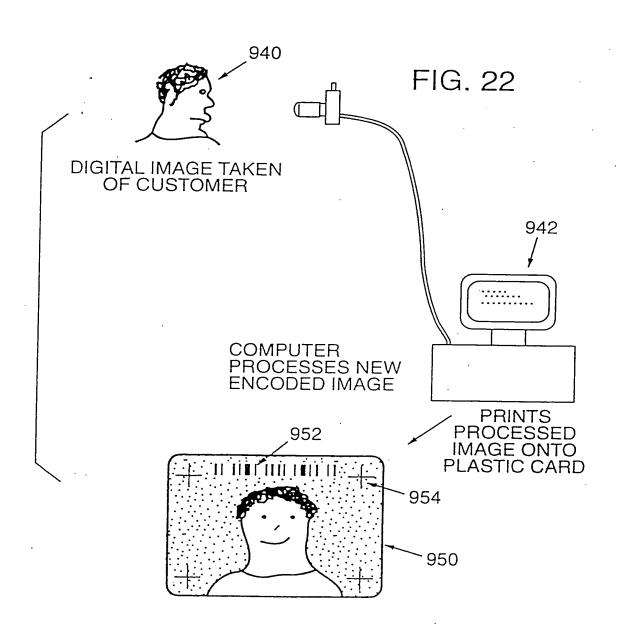
CENTER POINT OF RING, 872

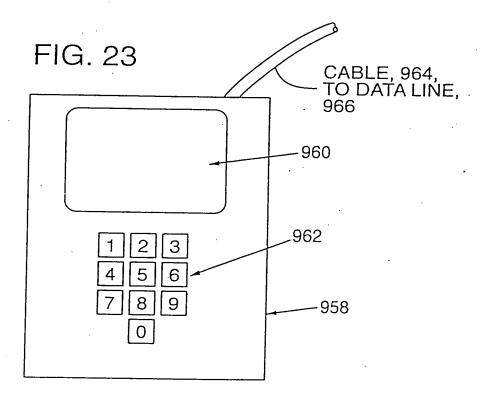
NOMINAL DISTANCE TO CENTER OF OUTER RING WIDTH, 870

NOMINAL DISTANCE TO CENTER OF OUTER RING WIDTH, 870

2-D BRIGHTNESS OF PHASE-ONLY FILTERED RING IS SIMILAR TO THE ABOVE BRIGHTNESS PATTERN ROTATED ABOUT CENTRAL POINT OF RING:



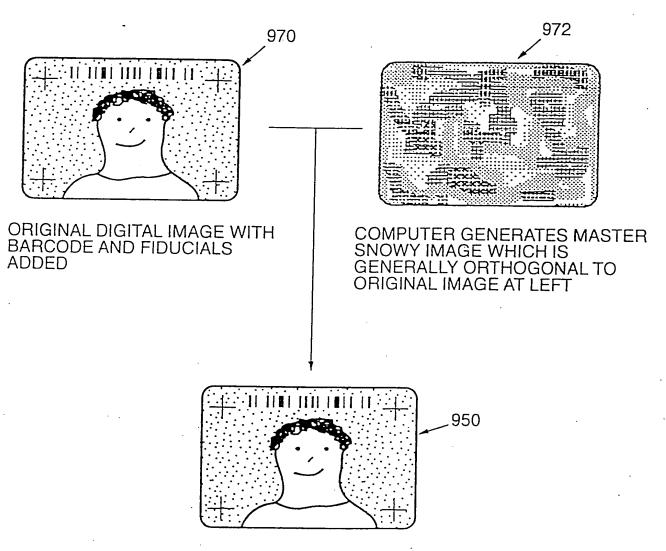




CONTAINS RUDIMENTARY OPTICAL SCANNER, MEMORY BUFFERS, COMMUNICATIONS DEVICES, AND MICROPROCESSOR

CONSUMER MERELY PLACES CARD INTO WINDOW AND CAN, AT THEIR PREARRANGED OPTION, EITHER TYPE IN A PERSONAL IDENTIFICATION NUMBER (PIN, FOR ADDED SECURITY) OR NOT. THE TRANSACTION IS APPROVED OR DISAPPROVED WITHIN SECONDS.

FIG. 24



COMBINED TO FORM PERSONAL CASH CARD

CSISESE IIOSS

FIG. 25 TYPICAL TRANSACTION STEPS

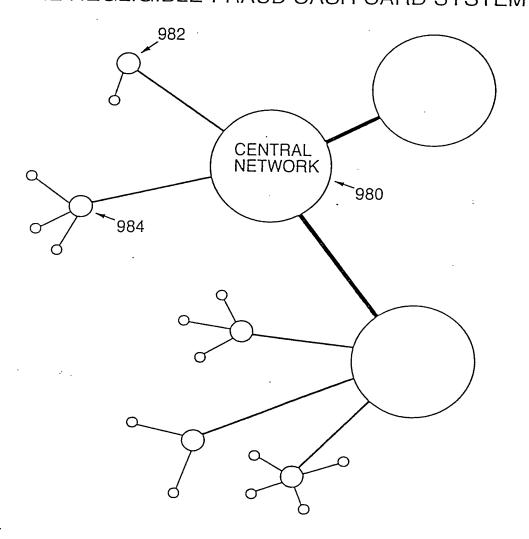
- READER SCANS IMAGE ON CARD, STORES IN MEMORY, EXTRACTS PERSON'S ID
 - 2. OPTIONAL: USER KEYS IN PIN NUMBER
- 3. READER CALLS CENTRAL ACCOUNT DATA NETWORK, HANDSHAKES
 - 4. READER SENDS ID, (PIN), MERCHANT INFORMATION, AND REQUESTED TRANSACTION AMOUNT TO CENTRAL NETWORK
- 5. CENTRAL NETWORK VERIFIES ID, PIN, MERCHANT INFO, AND ACCOUNT BALANCE
- 6. IF OK, CENTRAL NETWORK GENERATES TWENTY-FOUR SETS OF SIXTEEN DISTINCT RANDOM NUMBERS, WHERE THE RANDOM NUMBERS ARE INDEXES TO A SET OF 64K ORTHOGONAL SPATIAL PATTERNS
 - 7. CENTRAL NETWORK TRANSMITS FIRST OK, AND THE
 - SETS OF RANDOM NUMBERS

 8. READER STEPS THROUGH THE TWENTY-FOUR SETS
 - 8A. READER ADDS TOGETHER SET OF ORTHOGONAL
 PATTERNS
 8B. READER PERFORMS DOT PRODUCT OF
 RESULTANT PATTERN AND CARD SCAN,

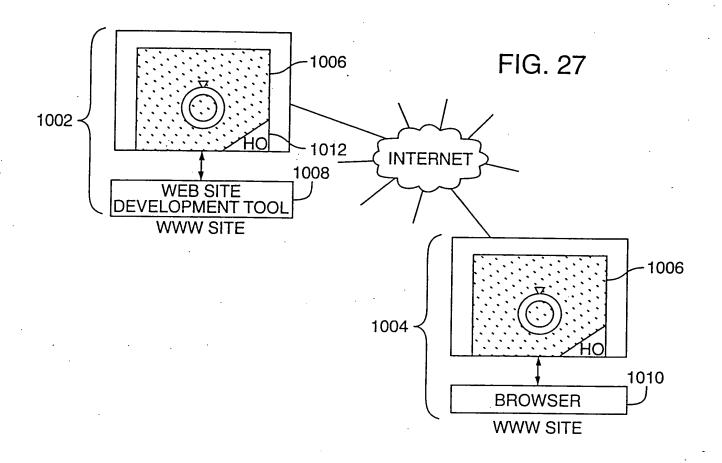
STORES RESULT

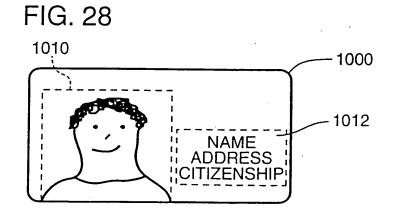
- 10. CENTRAL NETWORK CHECKS RESULTS AGAINST MASTER DOT PRODUCT RESULTS TO CENTRAL NETWORK 9. READER TRANSMITS THE TWENTY-FOUR
 - 12. CENTRAL NETWORK DEBITS MERCHANT ACCOUNT, 11. CENTRAL NETWORK SENDS FINAL APPROVAL OR DENIAL CREDITS CARD ACCOUNT

FIG. 26
THE NEGLIGIBLE-FRAUD CASH CARD SYSTEM



A BASIC FOUNDATION OF THE CASH CARD SYSTEM IS A 24-HOUR INFORMATION NETWORK, WHERE BOTH THE STATIONS WHICH CREATE THE PHYSICAL CASH CARDS, 950, AND THE POINT-OF-SALES, 984, ARE ALL HOOKED UP TO THE SAME NETWORK CONTINUOUSLY





#1 TEXT

#2 TEXT

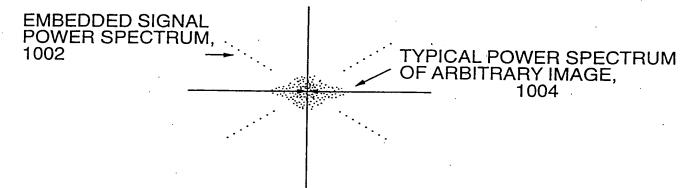
#3 TEXT

#4 TEXT

#5 #6

FIG. 27B #1 #2 #3 #4

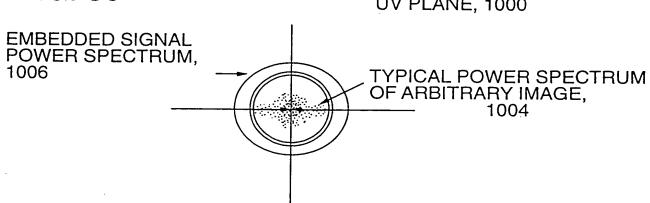
UV PLANE, 1000



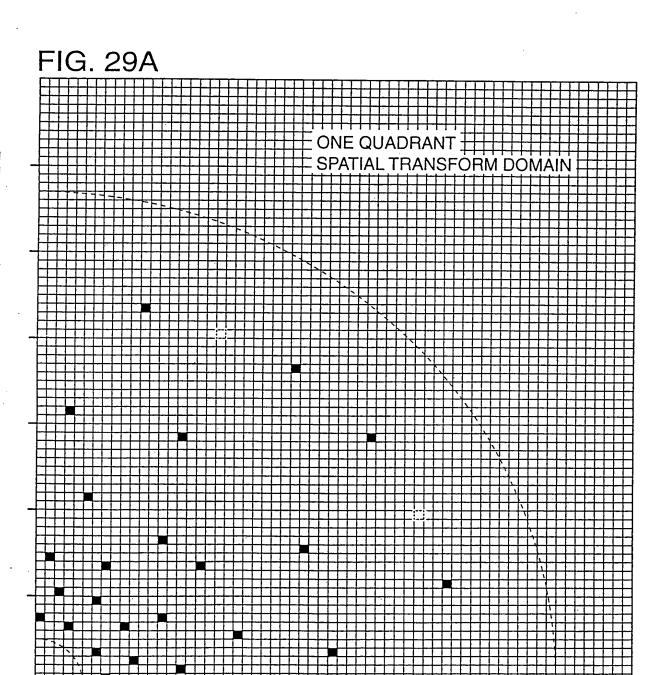
NON-HARMONIC SPATIAL FREQUENCIES ALONG THE 45 DEGREE AXES, GIVING RISE TO A WEAVE-LIKE CROSS-HATCHING PATTERN IN THE SPATIAL DOMAIN

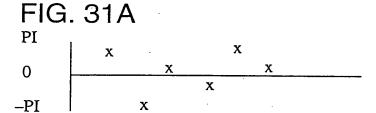
FIG. 30

UV PLANE, 1000



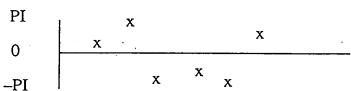
NON-HARMONIC CONCENTRIC CIRCLES IN UV PLANE, WHERE PHASE HOPS QUASI-RANDOMLY ALONG EACH CIRCLE, GIVING RISE TO PSEUDO RANDOM LOOKING PATTERNS IN THE SPATIAL DOMAIN





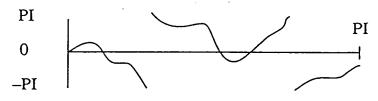
PHASE OF SPATIAL FREQUENCIES ALONG FORWARD 45 DEGREE AXES, 1008





PHASE OF SPATIAL FREQUENCIES ALONG BACKWARD 45 DEGREE AXES, 1010

FIG. 32A



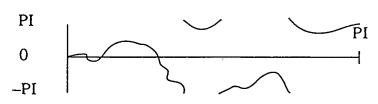
PHASE OF SPATIAL FREQUENCIES ALONG FIRST CONCENTRIC RING, 1012

FIG. 32B

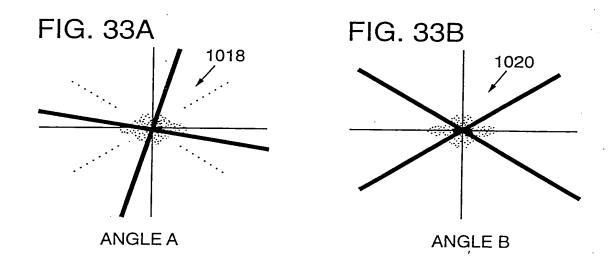


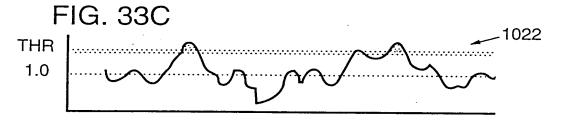
PHASE OF SPATIAL FREQUENCIES ALONG SECOND CONCENTRIC RING, 1014

FIG. 32C

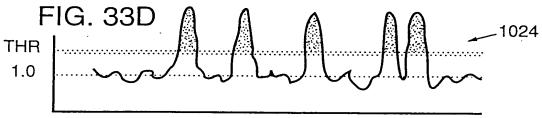


PHASE OF SPATIAL FREQUENCIES ALONG THIRD CONCENTRIC RING, 1016

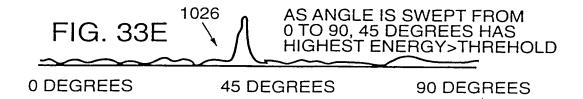


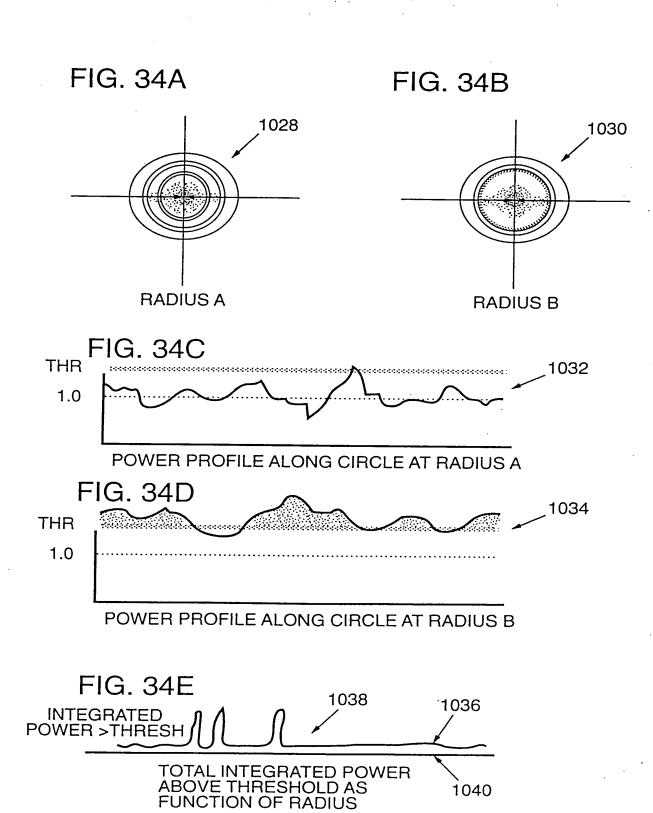


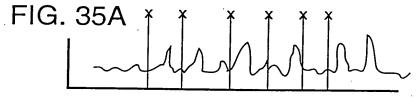
POWER PROFILE ALONG ANGLE A, AS NORMALIZED BY ITS OWN MOVING AVERAGE; ONLY A MINIMAL AMOUNT EXCEEDS THRESHOLD, GIVING A SMALL INTEGRATED VALUE



POWER PROFILE ALONG ANGLE B, AS NORMALIZED BY ITS OWN MOVING AVERAGE; THIS FINDS STRONG ENERGY ABOVE THE THRESHOLD



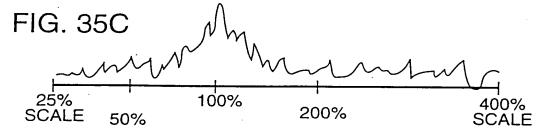




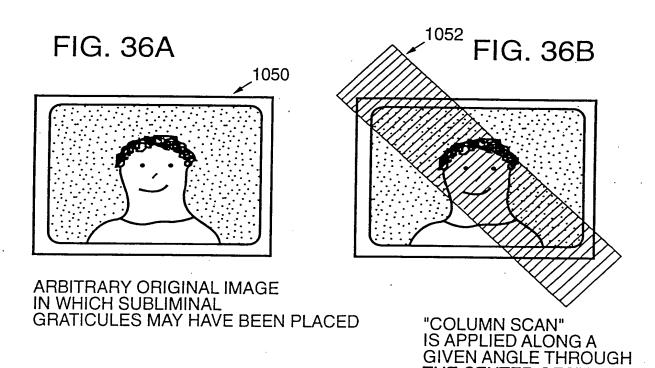
SCALE = A; ADD ALL POWER VALUES AT THE "KNOWN" FREQUENCIES", 1042



SCALE = B; ADD ALL POWER VALUES AT THE "KNOWN" FREQUENCIES", 1044

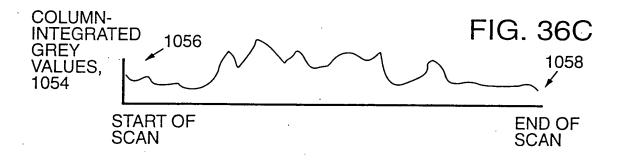


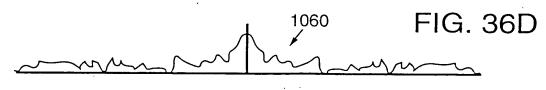
"SCALED-KERNEL" BASED MATCHED FILTER; PEAK IS WHERE THE SCALE OF THE SUBLIMINAL GRID WAS FOUND, 1046



THE CENTER OF THE

IMAGE





MAGNITUDE OF FOURIER TRANSFORM OF SCAN DATA

PROCESS STEPS

- 1. SCAN IN PHOTOGRAPH
- 2. 2D FFT
- 3. GENERATE 2D POWER SPECTRUM, FILTER WITH E.G. 3X3 BLURRING KERNEL
- 4. STEP ANGLES FROM 0 DEGREES THROUGH 90 (1/2 DEG)
- 5. GENERATE NORMALIZED VECTOR, WITH POWER VALUE AS NUMERATOR, AND MOVING AVERAGED POWER VALUE AS DENOMINATOR
- 6. INTEGRATE VALUES AS SOME THRESHOLD, GIVING A SINGLE INTEGRATED VALUE FOR THIS ANGLE
- 7. END STEP ON ANGLES
- 8. FIND TOP ONE OR TWO OR THREE "PEAKS" FROM THE ANGLES IN LOOP 4, THEN FOR EACH PEAK...
- 9. STEP SCALE FROM 25% TO 400%, STEP ~1.01
- 10. ADD THE NORMALIZED POWER VALUES CORRESPONDING TO THE 'N' SCALED FREQUENCIES OF STANDARD
- 11. KEEP TRACK OF HIGHEST VALUE IN LOOP
- 12. END LOOP 9 AND 8, DETERMINE HIGHEST VALUE
- 13. ROTATION AND SCALE NOW FOUND
- 14. PERFORM TRADITIONAL MATCHED FILTER TO FIND EXACT SPATIAL OFFSET
- 15. PERFORM ANY "FINE TUNING" TO PRECISELY DETERMINE ROTATION, SCALE, OFFSET

